the larger and most important part of the United States, that is, between latitudes 30½° and 47½°, the maximum scale error is only one half of one per cent. Only in southernmost Florida and Texas does this projection attain its maximum scale error of 2¾ per cent. This implies, however, an error in the areas at these extreme parts equal to the square of the linear distortion, or an error of 5½ per cent.

While this error in area may be accounted for by methods already described, the Zenithal projection on the other hand is free from this inconvenience.

The choice then between the Lambert zenithal and the Lambert conformal for a base map of the United States, disregarding scale and direction errors which are conveniently small in both projections, rests largely upon the choice of *equal area* as represented by the Zenithal and *conformality* as represented by the Conformal Conic projection—the former property appealing directly to the practical use of the map, the latter property being one of mathematical refinement and symmetry with definite scale factors available, the projection having two parallels of latitude of true scale, the advantages of straight meridians as an element of prime importance, and the possibilities of indefinite east and west extension without increase of scale error.

SPECIAL ARTICLES

SUBSTITUTES FOR PHENOLPHTHALEIN AND METHYL ORANGE IN THE TITRATION OF FIXED AND HALF-BOUND CO_2[1]

During the past year the writer has had occasion to make a great many determinations of sodium carbonate in the presence of the hydrate by the double titration method with phenolphthalein and methyl orange as indicators. The end point with methyl orange was not satisfactory. A number of new indicators were tried with the result that two were found which may be used as substitutes for phenolphthalein and methyl orange.

[1] Published by permission of the Secretary of Agriculture.

An added advantage of these two indicators[2] is that both have the same color changes. Six drops of one indicator in 75 c.c. of solution gives a fairly deep blue in the presence of sodium hydrate and carbonate and on titration with hydrochloric acid retains this color until the hydrate is all neutralized and the carbonate converted into bicarbonate when it changes at the neutral point to a muddy green and then with a slight excess of acid to a lemon yellow. The addition of three drops of the second indicator will now change the solution to a deep blue, which continues until the bicarbonate has all been destroyed, when the solution shows the same intermediate change as before and becomes a lemon yellow again when a slight excess of acid is present.

These indicators are among the nine recommended by Clark & Lubs[3] for the colorimetric determination of hydrogen ion concentration. The first indicator, thymol blue (thymol sulfon phthalein) is prepared by introducing 1 decigram of the substance into a Florence flask and then adding 4.3 c.c. of $n/20$ sodium hydroxid. The solution is best heated by introducing the flask into hot water and agitating until the indicator is all dissolved. When solution is complete, the volume is made up to 250 c.c. with distilled water.

The substitute for methyl orange is brom phenol blue (tetra bromo phenol sulfon phthalein). This indicator is made up in the same way except that 1 decigram requires only 3.0 c.c. of $n/20$ sodium hydroxide.

F. M. Scales
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[2] These indicators may be obtained from Hynson, Westcott & Dunning, of Baltimore, Maryland.

[3] Clark, Wm. Mansfield, and Lubs, Herbert A., *Jour. of Bacteriology*, Vol. II., Nos. 1, 2 and 3.

THE AMERICAN SOCIETY OF ZOOLOGISTS

The American Society of Zoologists held its seventeenth annual meeting in conjunction with Section F of the American Association for the Advancement of Science and the Ecological Society of America, December 29, 30 and 31, in the Soldan High School building, St. Louis, Missouri. President C. M. Child presided throughout the